

# Endoscopic Gastrostomy Button With Double-Lasso U-Stitch in Children

Federico G. Seifarth, MD, Matthew L. Dong, MD, Alfredo D. Guerron, MD, Jose S. Lozada, MD, David K. Magnuson, MD

## ABSTRACT

**Background and Objectives:** Placement of surgical gastric access is a common operative procedure, with multiple techniques. We describe a cost-effective, safe, and easy-to-perform primary endoscopic gastrostomy button placement in the pediatric population, using a novel double-transcutaneous lasso U-stitch push technique.

**Methods:** This is a retrospective review of a single center's experience of 24 consecutively performed primary gastrostomy button placements in infants and children aged 3 weeks to 20 years, from October 2012 through October 2014.

**Results:** The procedure was generally well tolerated, with no intraoperative complications. No conversions to laparoscopic or open procedures were necessary. There were no early tube dislodgements and no postoperative complications within the first 4 weeks.

**Conclusion:** The endoscopic primary gastrostomy button placement with a transcutaneous lasso U-stitch is a safe, fast, elegant, and cost-effective alternative to a standard percutaneous endoscopic gastrostomy placement.

**Key Words:** Surgical endoscopy, Pediatric surgery, Nutrition.

## INTRODUCTION

Gastrostomy feeding tube placement for enteral access is a common surgical procedure in children. In recent years, endoscopic and laparoscopic techniques have widely replaced the open, traditional Stamm procedure.<sup>1</sup>

Percutaneous endoscopic gastrostomy (PEG) was first described in 1980 by Gauderer et al<sup>2</sup> and is commonly applied in children. Popular laparoscopic techniques include the laparoscopic U-stitch technique, first described by Georgeson and colleagues,<sup>3</sup> and the laparoscopically assisted mini-open technique.<sup>4</sup>

The advantages of a laparoscopic approach lie in its direct visualization of the intestinal anatomy. Direct visualization eliminates the risk of undetected hollow viscus injury from percutaneous access and ensures safe placement of the feeding tube. By contrast, endoscopic percutaneous techniques are generally less invasive because they obviate the need for additional incisions.

The purpose of this study is to describe a safe and practical endoscopic technique for primary gastrostomy button placement combining favorable features of both the laparoscopic and endoscopic techniques: primary retrograde button placement and gastric peritoneal fixation as in laparoscopic procedures and reduced invasiveness of PEG.

## METHODS

### Patients

This is a retrospective study of sequentially performed endoscopically guided retrograde gastrostomy button placements from October 2012 through October 2014. After institutional review board approval, the charts of 24 patients were reviewed. All surgical procedures were performed at a single pediatric tertiary care center. The procedures were performed by 2 surgeons. Data were extracted from operative reports, surgical progress notes, and follow-up clinic visits with pediatric surgery, nutrition, and pediatric gastroenterology.

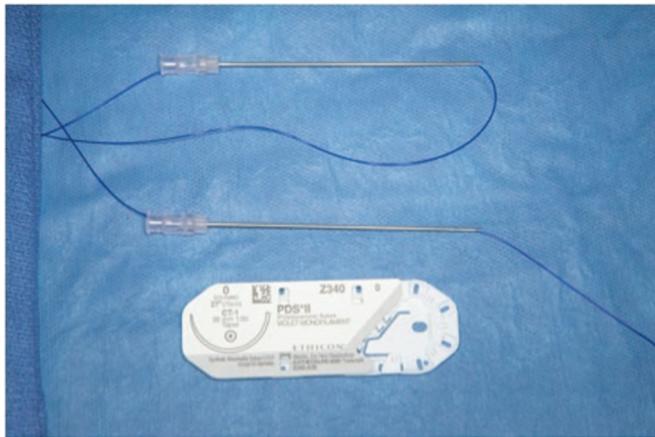
Department of Pediatric Surgery, Cleveland Clinic Children's Hospital, Cleveland, OH, USA (Drs. Seifarth, Magnuson).

Department of General Surgery, Cleveland Clinic Foundation, Cleveland, OH, USA (Drs. Dong, Guerron, Lozada).

Address correspondence to: Federico G. Seifarth, MD, Department of Pediatric Surgery, Cleveland Clinic Children's Hospital, 9500 Euclid Ave/A120, Cleveland, OH 44195, USA. Telephone: (216) 444-5515, Fax: (216) 445-1035, E-mail: seifarf@ccf.org

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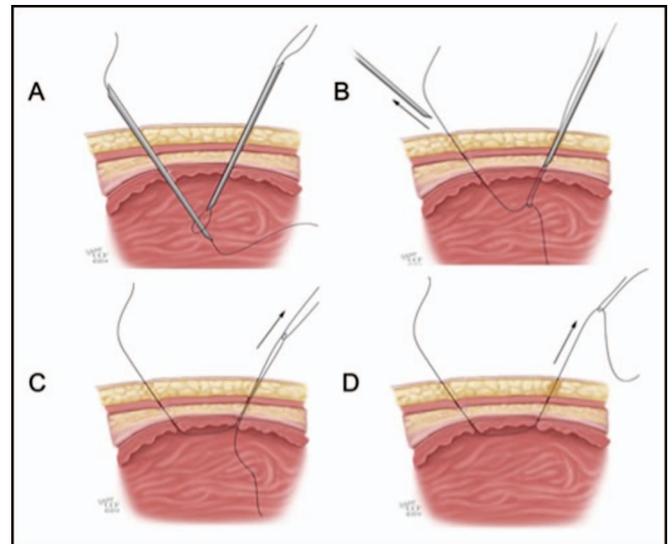
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**Figure 1.** Lasso apparatus, utilizing 18 gauge spinal needles threaded with 0 polydioxanone free sutures.

### Technique Description

With the patient under general anesthesia, upper endoscopy is performed with an Olympus 140 Series flexible endoscope (Olympus America, Center Valley, Pennsylvania). Incontrovertible transillumination and digital indentation are obtained. Under endoscopic visualization, an 18-gauge spinal-tap needle with a No. 0 polydioxanone loop is transcutaneously advanced into the stomach. A second needle is introduced 1 to 1.5 cm inferiorly. Through the second needle, a single No. 0 polydioxanone strand is advanced through the previously introduced polydioxanone loop within the stomach (**Figure 1**). The loop snares the single polydioxanone strand, and this end is pulled extracorporeally, thus creating a U-stitch. A second U-stitch is placed medially or laterally in an identical fashion. Gentle traction is applied to these U-stitches to ensure direct apposition of the gastric wall to the peritoneum (**Figure 2**). An AMT gastrostomy button placement kit (Applied Medical Technology, Brecksville, Ohio), containing a finder needle, a guidewire, serial dilators, and a measuring device, is used for gastrostomy button placement. Between the U-stitches, an incision is made and an 18-gauge needle is advanced into the stomach. A guidewire is threaded through the needle, and the Seldinger technique is used to serially dilate the tract to 22F. The abdominal wall thickness is measured and an appropriate size gastrostomy button placed (AMT Mini ONE button, size 12F or 14F, 1.2–3 cm; Applied Medical Technology). Placement is confirmed by endoscopy. The previously placed U-stitches are then tied down around the ends of the gastrostomy button (**Figure 3**). These stay sutures are left in place for 5 to 7 days. Patients are generally observed overnight, with initiation of feeding with Pedialyte (Abbott



**Figure 2.** (A) Using safe tract technique, a single strand is advanced into the abdomen with the free end extracorporeal, creating a loop. A second strand is passed through this loop. (B–D) The loop is used to snare the free strand and to pull it extracorporeally.



**Figure 3.** After transabdominal sutures are placed, PEG is placed with standard push technique under endoscopic vision.

Nutrition, Columbus, Ohio) commencing 3 to 6 hours after surgery. After examination by the surgical team in the morning, the tube is ready for use ad libitum.

Contraindications to PEG placement using the described technique are the same as those for a traditional PEG, including failure to obtain a “safe tract,” with clear transillumination and one-to-one indentation.<sup>5</sup> In this case series, preoperative imaging was obtained in 15 of 24 patients (62.5%), and we recommend this as a routine practice going forward. Certainly, if there is clinical suspicion of gastroesophageal reflux, gastric outlet obstruction, or intestinal malrotation, an upper gastrointestinal

**Table 1.**  
Patient Characteristics

	<b>Data</b>
Age, median (range)	12 mo (3 wk to 20 y)
Gender	9 female and 15 male
Weight, median (range), kg	9.0 (2.9–55.5)
BMI <sup>a</sup> , median (range), kg/m <sup>2</sup>	15.9 (10.9–26)
Operative time, mean (range), min	19 (11–46)
Time postoperatively to first feeding, median (range), h	7 (1–24)

<sup>a</sup>BMI = body mass index.

series or modified barium swallow to exclude these conditions should be obtained. Cosmetic results are identical to traditional PEG because the U-stitch does not leave permanent scars.

## RESULTS

A total of 24 procedures were performed using the described technique over the study period of 2 years. The patients' ages ranged from 3 weeks to 20 years (**Table 1**). All but 1 of these children had failure to thrive, 6 because of chronic lung disease of prematurity; 4 because of debilitating congenital heart problems; 3 because of genetic syndromes; 2 because of congenital gastrointestinal defects, which required surgical repair; 3 because of major neurologic developmental problems; and 2 because of neurologic developmental deficits. One patient had a glycogen storage disease, requiring enteral access for glucose control.

There were no intraoperative complications and no postoperative complications within 4 weeks' follow up. One case presented with granulation tissue 6 weeks after initial placement, which was cauterized. No patient had tube dislodgement within 30 days after the operation.

## DISCUSSION

After its introduction in 1980 by Gauderer et al,<sup>2</sup> PEG tube placement quickly gained popularity. It offered a safe and cost-effective alternative to the traditional open procedure and rendered general anesthesia in the adult population unnecessary. PEG was swiftly adapted to the pediatric population and became the preferred technique until implementation of laparoscopically assisted gastrostomy techniques. Opponents of the PEG technique emphasize the potential limitations including the inability to choose the ideal placement site, the risk of abdominal organ or

intestinal injury, and the lack of peritoneal stitch fixation to the peritoneal wall. Traditional PEG requires a second passage of the endoscope, as well as pulling a relatively large PEG tube through the oropharynx and esophagus, which is particularly problematic in infants and small children as compared with adults.

Techniques for percutaneous suturing as a minimally invasive technique in inguinal hernia repair have been described by Patkowski et al<sup>6</sup> and by use of a hydrodissection-lasso technique by Muensterer and Georgeson.<sup>7</sup> Application of the transcutaneous lasso U-stitch in combination with upper endoscopy eliminates some of these potential disadvantages. The described technique allows for initial gastrostomy button placement after safe fixation of the stomach to the peritoneum. The use of neonatal endoscopes minimizes trauma to the upper gastrointestinal tract while providing satisfactory visualization. The lasso U-stitch technique cannot completely avoid some of the increased risks inherent to endoscopic gastrostomy tube placement, such as intra-abdominal organ injury. However, with proper application of transillumination and digital indentation—the need for which has been well documented—the risk of hollow viscus perforation or solid organ injury can be minimized, if not completely eliminated as in our series of 24 patients.

In recent years various studies have prospectively evaluated the safety of the traditional PEG procedure. Fascetti-Leon et al<sup>8</sup> documented a major complication rate of 3.3% in a prospective multicenter observational study. Their study showed that thoracoabdominal deformities were an independent predictor of complications. In a prospective study at a single institution, Brewster et al<sup>9</sup> reported a total complication rate of 14%, mostly representing dislodgements (5.4%) and surgical-site infections such as early cellulitis (6%), and no incidence of intra-abdominal organ injury. They concluded that these complication rates are comparable with those of laparoscopic-assisted gastrostomies.

In their series of 461 patients undergoing laparoscopic primary button placement with transcutaneous U-stitch fixation, Arahamian et al<sup>10</sup> reported a total complication rate of 11.2%, including a 1.5% dislodgement rate and 0.7% chronic leak rate, with no reports of early cellulitis. We hypothesize that the peritoneal anchoring of the gastric wall prevents early dislodgement and contributes to a lower leak rate with associated cellulitis. In our series we observed no early dislodgement and a 0% early infection rate in the first 4 postoperative weeks.

The introduction of transcutaneous T-fasteners to the PEG procedure allowed secure fixation of the anterior stomach

wall—comparable with the open procedure. This technique was first described by Brown et al<sup>11</sup> and subsequently modified to the primary gastrostomy button “push” technique for the pediatric population.<sup>12</sup>

Alternatively to T-fasteners, an endoscopic U-stitch technique for primary gastrostomy button placement has been described, avoiding the costly application of commercially available T-fasteners. This method uses transcutaneous U-stitches of nonabsorbable sutures on large needles for gastric fixation, placed under endoscopic visualization. Nixdorff et al<sup>13</sup> reported a 1.7% cellulitis rate and 0.9% colonic perforation rate in their retrospective review of 121 pediatric patients undergoing this procedure. In our technique the use of straight 18-gauge needles to place the lasso U-stitch reduces the risk of accidental intestinal injury from blind needle sweeps, comparable with T-fasteners.

The described endoscopic gastrostomy button placement with transcutaneous lasso U-stitches is a safe and cost-effective alternative for primary retrograde gastrostomy button placement with high patient satisfaction. Compared with T-fasteners, the applied polydioxanone sutures are completely absorbable, which reduces the risk of potential gastric erosion/abscess formation from a retained foreign body. There are limitations to this study. Although it establishes the feasibility of this technique, we report our initial experience in a small cohort of 24 patients. Further investigation involving more patients is warranted to determine the long-term complication rate and to compare this technique with traditional PEG techniques and established laparoscopically assisted procedures. Although general anesthesia is required for the procedure in the pediatric population, similar to traditional PEG, this technique could likely be performed using local anesthesia with sedation in adults. Further study is required to determine the role that this technique might play in the adult population.

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